

Patient protection basics

Control the patient identity and **pregnancy**.

Indicate the anatomical side of the patient with a **lead marker** before exposure.



Measure the anatomical part in order to select the correct exposure factors.

Select the optimum kilovoltage (KV) for each projection

Collimate the primary

beam at all times



Means to permanently transfer **patient identification**, prior to processing of the images, must be provided.

Where practicable, use **PA** projections in preference to AP.

Controlled areas

Members of the public are not allowed to enter controlled areas unsupervised.

Non-radiation personnel or members of the public shall not remain in the x-ray room during any x-ray procedure unless they are required to be in attendance.

Holding of patients and cassettes

The occasional use of non-radiation personnel to give assistance, particularly in the ward or theatre radiography, is acceptable but shall involve the full use of protective clothing, devices and techniques to

minimise personnel dose. Care shall be taken to ensure that the **same** non-radiation personnel is not always involved.

Women who are pregnant shall not be used in this role.

No person shall hold a patient, x-ray film cassette, or other imaging equipment **or face the x-ray tube** head in position during exposures unless it is **otherwise impossible** to obtain a diagnostically useful image.

Before we discuss **shielding**....

Optimisation strategies more impactful than only shielding patients.

Routine contact shielding is no longer recommended by some countries for abdomen examinations. Why?

- If placed in the primary field -the risk of over-exposure WHEN USED WITH automatic exposure control. **We recommend however manual exposure for neonates and pediatric patients!**
- Shielding has a negligible impact on patient dose, focus on more impactful optimisation strategies.
- Internal scatter is the predominant component of any radiation dose measured within the patient close to the primary beam.

Optimisation parameters in projection radiography

1. **COLLIMATION**- optimise the x-ray field size (collimation / CT scan range).
 - Radiography: optimal collimation reduces effective dose up to 48%
 - CT: 1-3cm scan length reduction = uterus dose reduction and 24% for chest CT; 47% for upper abdomen CT.
 - Fluoroscopy: 60% patient dose reduction and 46% operator dose reduction.
2. EXPOSURE FACTOR (kV, mA, s, filtration, etc) selection based on size and study indication- so measure!
3. AEC (Automatic exposure control use). Make sure to select the appropriate chamber selection and metal artefact avoidance.

4. Grid use (removed for paediatrics / small (based on size) patients. Use virtual grids.
5. Special patients (paediatrics and repeated examinations for neonates / pregnant patients). Fewer projections and work accurate!
6. **Source to image distance (SID) – never closer than 110cm.** For fluoroscopy as far as possible- never closer than 30cm!
7. Geometry (PA vs AP, this change increases the source to image distance). The breast and thyroid and eyes!
8. Receptor selection (CR, DR, FS). Thus the correct Bucky and the correct speed of IR.
9. Immobilisation of the patient. Thus no repeats!
10. Cooperation of the patient with clear instructions / effective communication/

Fluoroscopy optimisation

- Minimize fluoroscopy time;
- Use collimation;
- Take as few radiographic images as possible; make use of the last image hold.
- Use magnification appropriately (avoid is best practice);
- Decrease the patient-to-image receptor (image intensifier or flat panel detector) distance;
- Increase the X-ray tube to patient distance;
- Be aware of tube angulations. Steep angulations increase the dose!

Equipment-related optimisation for fluoroscopy:

- Use the lowest manufacturer's setting of fluoroscopic dose rates and the highest kVp consistent with the maintenance of image quality;
- Position the X-ray source relative to the patient and staff so as to deliver the least possible dose; REMINDER THE SOURCE OF SCATTER IS ON THE ENTRANCE SIDE OF THE BEAM. Example: It is best practice for staff to be positioned on the Image Intensifier side of the patient during lateral positioning of the C - arm.
- Use pulsed fluoroscopy rather than continuous, and use the lowest pulse frequency compatible with adequate image quality;
- Use the last image hold and image capture;
- Be aware of alarm levels for time and higher dose rates in fluoroscopy;
- Make sure appropriate quality control is performed.

Gonadal Shielding

Use gonadal shielding in **males** to reduce the dose to the gonads by 95% when the gonads are within the primary beam or within 5 cm of the beam. Note: This is ONLY applicable for **manual exposures**. This could benefit the patient during **repeated** examinations and when the physician requests neonate **chest and abdomen** on one projection.

Shielding must not exclude important diagnostic information or interfere with the study.

Gonad shields: a lead equivalence of 0.50mm Pb is required.



Shielding patient ideas (manual exposures)

Utilise lead shielding for all patients during examinations- not only the gonads- but wrap around or full apron depending on the projection. Shield the patient areas of non-interest with a lead apron – especially children.

Shielding idea for the lumbar spine. Note the lead strip posterior to absorb scattered radiation.

Shielding idea for a shoulder examination

